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ABSTRACT

This paper focuses teachers' images of their own computer-integrated teaching: the way the teaching process is structured by teachers' relationships with computer technology and how this relationship defines their work and their thoughts, voices, and experiences. It also examines how teachers themselves comprehend and convey their roles and thus search for a new paradigm of opportunities that encompass these roles. Image is proposed in this study as a construct to understand teachers' particularistic knowledge in the context of teaching with computer technology. This study incorporates the utilization of teachers' metaphors as a tool to investigate teachers' images of computer-assisted instruction. Data were collected in three steps. Teachers were instructed to write down personally constructed metaphors in the form of explicit metaphorical statements. This was followed by their creation of narratives of selected metaphorical statements. The last step involved the teachers' derivation of metaphors for the statements. Findings indicate that these underlying images are significant and should be embraced by technology trainers and teacher educators to help better prepare teachers for using technology in instruction. Contains 35 references. (AEF)

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Research Paper: Moving Beyond the Crossroads: Teachers as Agents for Change

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Images of Teaching with Computer Technology: A Metaphorical Perspective

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Key Words: metaphors, images, teaching actions, computer technology integration

There has been keen ongoing interest in how teachers integrate computer technology in to their teaching (Dias, 1999; Hadley & Sheingold, 1993; Sandholtz, Ringstaff, & Dwyer, 1997). The aim of this research is to describe how teachers' images of teaching with computer technology can be a means to understanding how they construct meaning in their integration of computer technology in to their teaching.

This paper focuses on the actions of teaching through teachers' images of their teaching with computer technology integration in to teaching-learning environments: the way the teaching process is structured by teachers' relationships with computer technology and how this relationship defines their work (Bigum, 1997) and their "thoughts, voice and experiences" (Budin, 1999, p. 668). It also focuses on how teachers themselves comprehend and convey their roles (Budin, 1991) and thus search for a new paradigm or paradigms that encompass these roles (Kerr, 1991). These insights may shed light on the range of opportunities afforded by technology from the teachers' perspectives.

Salomon (1998) argues that the technological affordances provided by computer technology offer needed tools and novel teaching-learning opportunities in classroom teaching. This, he states, requires novel psychological insights to materialize in the classroom. Salomon claims that human understanding of cognition and the technologies they develop and utilize as tools for teaching are comprehended metaphorically. Both are thus linked, as the following quote signifies:

> Historically, our understandings of the human psyche, particularly cognition and the technology we employ as metaphor or as tools for teaching tend to go hand in hand … this parallelism between our psychological understandings and the technologies available to us remain unchanged…. The way we believe people learn and think and the information technologies we develop to make that possible continue to live in a tight, reciprocally supportive marriage. (Salomon, 1998, p. 4)

An implication garnered from this perspective strengthens the notion that the way we conceptualize our psychological insights in relation to pedagogical actions afforded by technologies can be conveyed as metaphors.

Thus the preceding brief review concurs with what Kerr (1996, p. 23) refers to as a new paradigm in research in technological affordances and teachers, "a person-centered vision for technology in education."

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It is imperative to understand that teachers' relationships with computer technology integration may lead us to consider the nature of teachers' goals and how they fulfill them (Bromley & Apple, 1998). The essence of what teachers actually do in classrooms and a comprehension of their views—an in-depth "reappraisal" (Scimshaw, 1997, p. 112)—of teachers' use of computer technology may be revealed.

Method of the Study

Image is proposed as a construct to understand teachers' particularistic knowledge in the context of teaching with computer technology. This particularistic knowledge is defined as the "particulars of practice" providing a "rich picture" (Johnston, 1992, p. 124) of teaching actions with computer technology. The study reported in this paper has incorporated the utilization of teachers' metaphors as a tool to investigate teachers' images of teaching with computer technology.

By using metaphors to illuminate teachers' images, the study offers a means to comprehend how teachers see themselves teaching with computer technology. Metaphors provide a means to make explicit the teachers' language of practice and provide insights in to their teaching practice with computer technology leading to a discussion of teachers' construction of meaning (Collins & Green, 1990) with the integration of computer technology in to their teaching.

A Review of the Methodology Used to Elicit Teachers' Metaphors

The approaches to research on metaphors for teaching fall into two categories. The first category is the natural metaphoric language (Morine-Dershimer & Reeve, 1994) or speech metaphors (Connelly & Clandinin, 1988) that are prevalent in teacher discourse. The second category is the generation of verbal or written explicit metaphors (Marshall, 1990) or metaphorical statements (Gurney, 1995; Miller & Fredericks, 1988) by teachers resulting from assigned or instructional activities.

The speech metaphor analysis approach and metaphorical statement approach have both been extensively used in educational research. The identification and analysis of preservice and inservice teachers' metaphors have contributed to the understanding of teachers' thinking, professional knowledge, beliefs, teacher role conceptualizations, images of teaching, and teaching actions.

In the field of explicit metaphorical statements research, metaphors have been used to investigate the images of how teachers view themselves and their learners in the classroom (conceptions of teaching and learning; Gurney, 1995); images that teachers have of themselves in fulfilling their roles (Berliner, 1990); and the images of personal practical knowledge (Ritchie & Russell, 1991). The underlying themes in the utilization of metaphors in these areas of research were based on the assumptions that "images lead to metaphors"; "metaphors provide a careful means for clustering images"; and "images are metaphorically embedded" (Bullough, 1991, p. 200). Ritchie and Russell (1991) also claim that images are expressed as metaphors and that these metaphors make the images (embedded within the metaphors) graphic and visible.

The relationship between metaphors and images is expressed clearly by Calderhead and Robson (1991, as cited in Bullough & Stokes, 1994, p. 198):

> In fact being able to recall images and to adopt and manipulate these images in reflecting about action in a particular context is possibly an important aspect of the task of teaching....

> Images, whether representations or reconstructions, provide us with an indicator of teachers' knowledge attributable to different training experiences and the relationship between knowledge and observed practice.

Thus, metaphors can shed light on the images that teachers capture and encapsulate and refer to in the course of their teaching.

Research studies by Gurney (1995) and Miller and Fredericks (1988) have provided much support for the use of metaphorical statements. In a study conducted with preservice teachers' metaphorical statements of the teaching and learning process, Gurney demonstrated that metaphorical statements could be a device in the envisioning of teachers' conceptions of teaching. This, he suggested, could be done by analyzing metaphorical statements for themes and moods. Miller and Fredericks (1988), in a study involving 25 students in a sociology of education class, had also demonstrated that metaphorical statements helped to "reflect and structure individual experience" (p. 263) and claimed that metaphorical statements were viable as a "rich source of qualitative data" (p. 269).

On a final note, Dickmeyer (1989) has suggested that metaphors can depict an oversimplified view of the phenomenon under study. In this study such oversimplification is viewed as a "virtue" following the convention of Bullough (1991, p. 44). It is acknowledged that the simplification would enable the teachers to reflect on and analyze more easily their teaching with computer technology.

Data Collection

Data for this study were elicited by the second approach to the use of metaphors—explicit metaphors generated in response to an instructional task. The data collection consisted of three steps. First, teachers were instructed to write down personally constructed metaphors (Munby, 1987, as cited in Ritchie, 1994) in the form of explicit metaphorical statements. This was followed by teachers creating narratives (Tobin & Tippins, 1996) of selected metaphorical statements. The last step of this data collection stage involved the teachers' derivation of metaphors for the statement "The teacher as ..." (Berliner, 1990; Ritchie, 1994; Ritchie & Russell, 1991; Tobin, 1990, 1993; Tobin & LaMaster, 1995; Tobin & Tippins, 1996) from the narratives of their respective metaphorical statements.

Step I: Generating Written Metaphors

The use of the metaphorical statement approach in this step followed the convention of Miller and Fredericks (1988), Gurney (1995), and Inbar (1991). The purpose of generating personal metaphors in this study was to capture and encapsulate participants' teaching actions with computer technology in graphic and visible ways.

In this study the six secondary school teachers from the Republic of Singapore were asked to write down three or four metaphors each for their teaching process with computer technology. Metaphors were elicited during the five-month research cycle. The teachers were asked:

> Please write three or four metaphors of your teaching process with computer technology.

The purpose of writing more than one metaphorical statement was to prevent teachers from responding to the task by giving a one-sided emphasis on selected aspects of the phenomenon under study (Inbar, 1991). In addition, Bullough (1991) cautioned that single metaphors would not suffice in capturing the phenomenon under study. All the metaphors were collected and compiled by the researcher.

Step II: Deriving Narratives from Metaphorical Statements

Following the verification process, the qualified metaphors (refer to Gurney, 1995, for a detailed process for qualification of metaphorical statements) were returned to the teachers for corroboration. This step followed the convention of Tobin and Tippins (1996) and Inbar (1991). Teachers were asked to select one metaphorical statement each that was representative of their teaching with computer technology from the metaphorical statements that they had written and that were verified. The teachers were then asked to read their respective chosen metaphors and describe the metaphor. The following phrase was used by the researcher to assist the teachers in explaining their metaphors.

> Choose one metaphor which is the most representative of your teaching with computer technology and please explain it in a few words.

The main purpose for this procedure was to make explicit the meaning underlying the chosen metaphors rather than rely on the researcher's interpretation of the meanings. Aspin (1984, p. 34) had stressed the need to use metaphors as a generative tool for educational discourse and not merely as "fixers or thought stoppers." In addition to that, Inbar (1991, p. 25) cited two important justifications for the preceding step: first, teachers' choices of representative metaphors were made explicit, revealing the "deeper meaning" that they had for the chosen metaphor, and second, teachers' explanations served as connections between the tacit and the explicit domains of their knowledge. Therefore, by exploring the narratives, a better perspective of the images of teaching with computer technology was focused on.

Step III: Creating Metaphors for "The teacher as ..."

This stage involved the participants in reading their narratives three times and relating their narratives to the following phrase:

> Metaphors for "The teacher as ..."

Responses were transcribed by the researcher, and teachers were asked to verify their metaphor by reading their narratives again and confirming their choice of metaphor for "The teacher as ...".

The purpose for this procedure was to allow teachers to read their narratives in order to capture their own images of teaching with computer technology and encapsulate them in another metaphor. The narratives were the depiction of "actions, causes and consequences" (Lyle, 2000, p. 59) of teaching actions with computer technology integration. This step gave the teachers an opportunity to reflect on their own practices and look at the language they had assigned to their teaching actions (Briscoe, 1991). This was also a way for the teachers to "re-vision" (Connelly & Clandinin, 1988, p. 77) their construction of metaphorical sentences and related narratives, and to contextualise the teaching actions in another metaphor, thereby structuring one's teaching practices and making explicit personal practical knowledge.

Furthermore, by looking back at the construction of practice especially with computer technology, teachers were reflecting on what they perceived as the "visual imagery" (Berliner, 1990, p. 85) embodying the requirements of their roles in the classroom. In addition, "The teacher as ..." metaphors could reveal the thoughts and perceptions that teachers have of themselves (Anderson, 1995).

This process enabled the researcher to get a further set of coherent and consistent metaphors that alleviated the major concern of single metaphors not being enough to describe the complexities of the teaching process with computer technology.

Thus by eliciting a second set of metaphors from the teachers' own narratives, insights in to teachers' images of teaching actions were explored. Table 1 illustrates the data collection steps previously depicted.

Table 1. Components of the Data-Gathering Process by Steps of Occurrence

Data Collection Actions	Instructions That Prompted Actions	Data That Actions Produced
Step I: Personally Written Metaphors		
Collection of metaphorical statements from teachers.	"Please write three or four metaphors for your teaching process with computer technology."	Teachers' handwritten metaphorical statements.
Qualification and Verification of Metaphorical Statements		
Step II: Derivation of Narratives		
Teachers select the most representative statement from their own set of metaphorical statements.	"Choose one metaphorical statement which is most representative of your teaching with computer technology and please explain in a few words."	Audio recording and verbatim verbal transcript of participants' explanations of their most representative metaphorical statement.
Step III: Metaphors for "The teacher as ..."		
Derivation of metaphors for "The teacher as ..." from teachers' own narratives.	"Please read the narrative for your representative metaphorical statement at least three times. Can you now complete the phrase 'The teacher as ...'."	Audio recording and verbatim verbal transcript of teachers' responses.

Analysis of the Data

Data collection generated three sets of results: personally constructed metaphorical statements; narratives of teachers' most representative metaphorical statements for teaching with computer technology; and "The teacher as ..." metaphors. The metaphors for "The teacher as ..." were used to derive corresponding images and associated images depicted in the narratives for each teacher respectively.

Findings

From the analysis of the data the teachers' images of teaching with computer technology were derived. Consideration of the participants' metaphorical statements (Table 2) and their metaphors (Table 3) revealed connections that suggest conceptual coherence among the metaphorical statements, the narratives, and "The teacher as ..." metaphors.

Table 2. Teachers' Most Representative Metaphorical Statements for Their Teaching Process with Computer Technology

Sundari
Computer technology is a tool I use to anchor my students so that they are focused.
Anthony
To teach or learn with computers is like learning to drive a car. Once the basics are mastered, driving is easy. Like driving it can break down and cause frustrations.
Ning
Computer technology is one of the tools in my toolbox that can help the students make meaning of what they are learning.
Angela
Computer technology to teaching is like seasoning to cooking. Appropriate quantity added at an appropriate time makes the dish taste better.
Tan
Computer technology in my teaching is like a bank. A lot of wealth is stored there. Pupils withdraw from it.
Woo
The teacher gives the skeleton and the students use computer technology to build up the meat of the skeleton.

Table 3. "The teacher as ..." Metaphors

Participants	Metaphors for "The teacher as ..."
Sundari	Captain
Anthony	Artist
Ning	Director
Angela	Cook
Tan	Director
Woo	Head Chef

Discussion

All the teachers who participated in this study communicated their images of teaching actions with computer technology integration through their metaphors (metaphorical statements and "The teacher as ..." metaphors) and accompanying narratives. The narratives served to unravel the conceptual mappings (Lakoff, 1994) that metaphorical statements and the "The teacher as ..." metaphors had encapsulated. The corresponding and associated images depicted in the narratives together with the metaphors (metaphorical statements and "The teacher as ..." metaphors) revealed how psychological insights were related to pedagogical actions (Salomon, 1998).

The teachers' metaphorical statements basically depicted teaching actions with computer technology as a tool with a purpose, "a tool I use to anchor" and "to build up," or as a tool itself that had a function or served to perform a function, "a car," "bank," and "one of the tools in my toolbox." The corresponding and associated images in the narratives further embellished the characteristics of the tool image together with the teaching images present in the narratives. For example, Sundari's image of teaching using computer technology involved images of an "anchor" in the "sand." Sundari's role in relation to the learning process with computer technology was to focus students onto the knowledge using the computer technology. The computer technology was the source of the knowledge—"it is like the anchor on a ship. It is deeply rooted in the sand"—to be transferred to the students. The captain metaphor revealed the image of a teacher in control of students' learning with the aid of computer technology. In the context of teaching with computer technology, it was possible that Sundari perceived the teacher as controlling the learning process of students by stabilizing the process with the computer technology, like a captain stabilizing a ship with an anchor. This results in students being focused on the content to be learned.

Encapsulated in the rest of the teachers' "The teacher as ..." metaphors and metaphorical statements were also corresponding and associated images as revealed by the narratives. The artist metaphor depicted Anthony's image of teaching with computer technology as being centered on the mastering of the computer technology for teaching, just like mastering the skills to drive a car. The director metaphor captured Ning's image of a teacher directing students in the use of computer technology for their own personal learning outcomes. The cook metaphor captured the image of Angela as a teacher who put much effort in to the integration of computer technology, with consideration given to the choice of software/hardware and timing, to make the teaching process effective.

The director metaphor encapsulated Tan's image of teaching with computer technology as a teacher directing students to use the computer technology like a "bank." Students were to "draw" content from the computer technology. The head chef metaphor encapsulated Woo's image of teaching with computer technology as a teacher needing to be in complete charge of the teaching process so that students will gain better content knowledge or even more content knowledge.

Conclusion

In this paper, the focus was to describe how teachers' images could help to increase the understanding of teachers' construction of meaning in teaching with computer technology integration. The empirical findings of this study have allowed the building of a relationship between the psychological insights, as captured and encapsulated by metaphors, and that of the narratives, which depicted the pedagogical actions. The findings further imply that teachers construct mental images to view and understand their thoughts and actions (Briscoe, 1991). The computer technology integration, in this study, was structuring and influencing the teachers' understanding leading to utilization of how teaching and learning were taking place. The study further reflects on how teachers operationalize teaching actions with images of themselves, the computer technology, their students, and the learning process. To help teachers utilize computer technology in their teaching there is a need for teacher educators during preservice and inservice courses to examine teachers' images. The findings here present a plausible reference to teachers' construction of meaning with the integration of computer technology in to teaching actions.

Implications

Teacher educators taking part in inservice and preservice courses involving the integration of computer technology in to pedagogy should give early attention to the images that teachers' thought structures encompass.

Inservice computer technology trainers have to look closely at their teaching approaches to accommodate the images that teachers already have of teaching with computer technology. Inservice computer technology trainers should embrace these underlying images to bring about effective ways to prepare teachers in their use of computer technology for pedagogical purposes.

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